

# THE ROLE OF CONTEXT IN THE DEFINITION AND USE OF ENVIRONMENTAL INDICATORS

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# THE ROLE OF CONTEXT IN THE DEFINITION AND USE OF ENVIRONMENTAL INDICATORS

COST 356 Seminar:

" ***Towards the definition of a measurable environmentally sustainable transport"***

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# Why is context a concern?

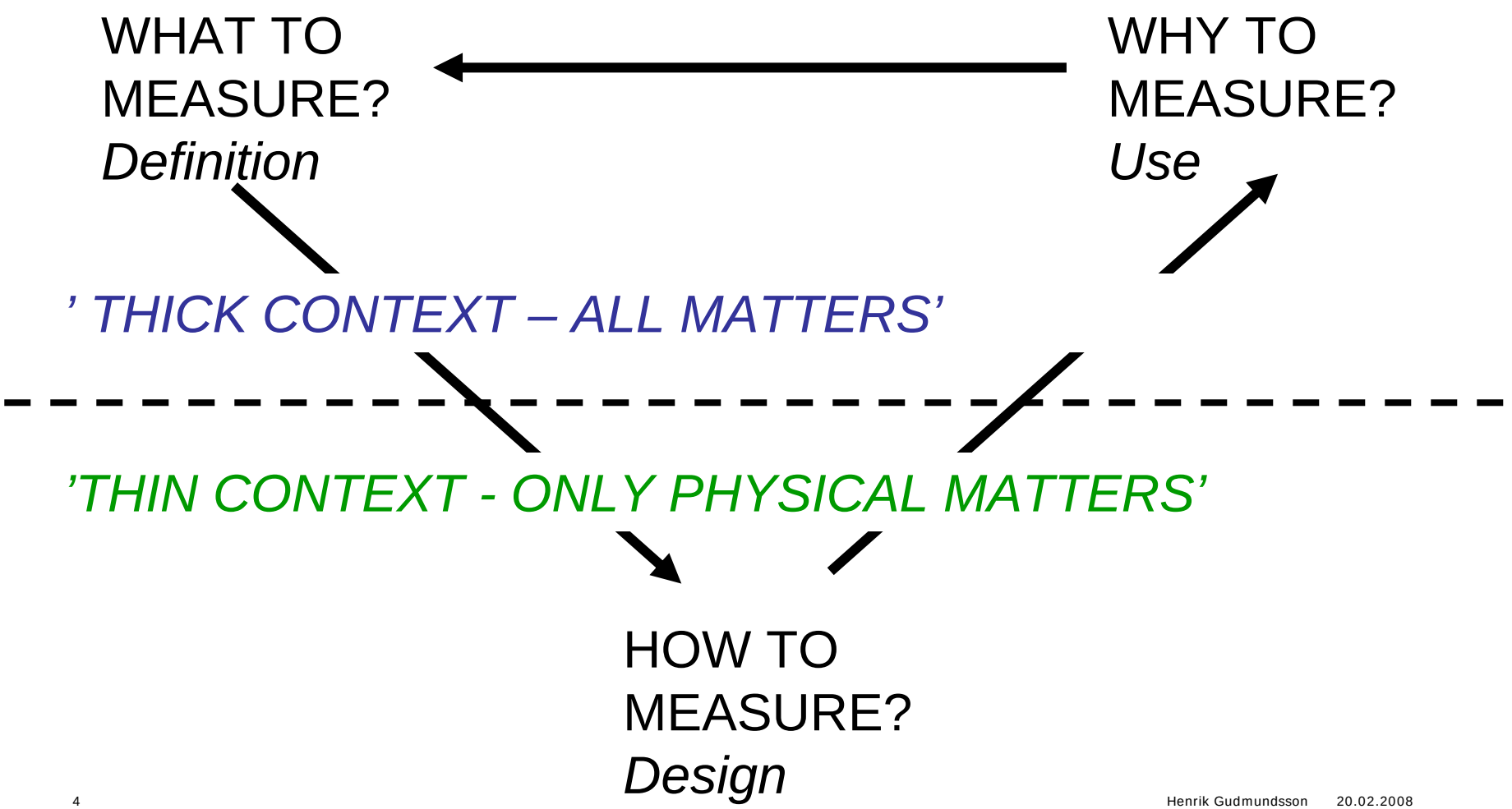
- Discussed since the beginning af COST Action 356
- Task: can we establish 'better' indicators of EST?
- Raises issue of context:
  - Better for whom? (analyst, politician,decision supporter, public)
  - Better for what? (more detailed assessment? CBA or EIA? fuller representation of sustainability? ex ante? ex post?)
- Some indicators may be 'universal'; others not
- Examples:
  - 'Modal split compared to 1998' (EU, not elsewhere)
  - 'Emission density' (OK for some health aspects, not for others)
  - VKT/year (maybe OK for $CO_2$, not for noise)
  - Deaths per 100.000 VKTs (policy); per km of road (citizen)
- Context is the surroundings where indicators are defined, designed and applied

# COST 356 analysis so far….

- Progress…Distinction between:
- *Physical* context (indicators as environmental measurements; main question: How to measure?),
  - The period of the source: day, night, year…
  - The position of the source: altitude, urban/rural
  - The initial state of the environment etc
- Strategies proposed to deal with it….

- *Decision* context (indicators as decision making tools; main questions: Why and what to measure?)
  - Purpose of assessment
  - Definition of (environmental) sustainability
  - Level of desicion making
  - Who are taking part, who provide input who need output

# Conceptual model….



# Problems…

- ”Searching with a very thin context generally produces results with too may answers to choose from”

(http://www.systems-thinking.org/mom/index.htm)

- Indicators may be *based on* measurement (or calculations), but indicators *are* not measurements

# Example of indicator selection procedures..

| Girardin et al 1999 (Agriculture) | Rochet & Rice 2005 (Fisheries) |
|---|---|
| 1. Definition of objectives | 1. Determine user needs |
| 2. Choice of the type of user | 2. Develop a list of candidate indicators |
| 3. Construction of the indicator | 3. Determine screening criteria |
| 4. Determination of norms and veto thresholds | 4. Score indicators against criteria |
| 5. Sensitivity test | 5. Summarize scoring results |
| 6. Probability test (define 'probability zones') | 6. Decide how many indicators are needed |
| 7. Usefulness test | 7. Make final selection |
| ***'Pure' measurement is not a part……..*** | 8. Report on the suite of indicators |

# Outlook

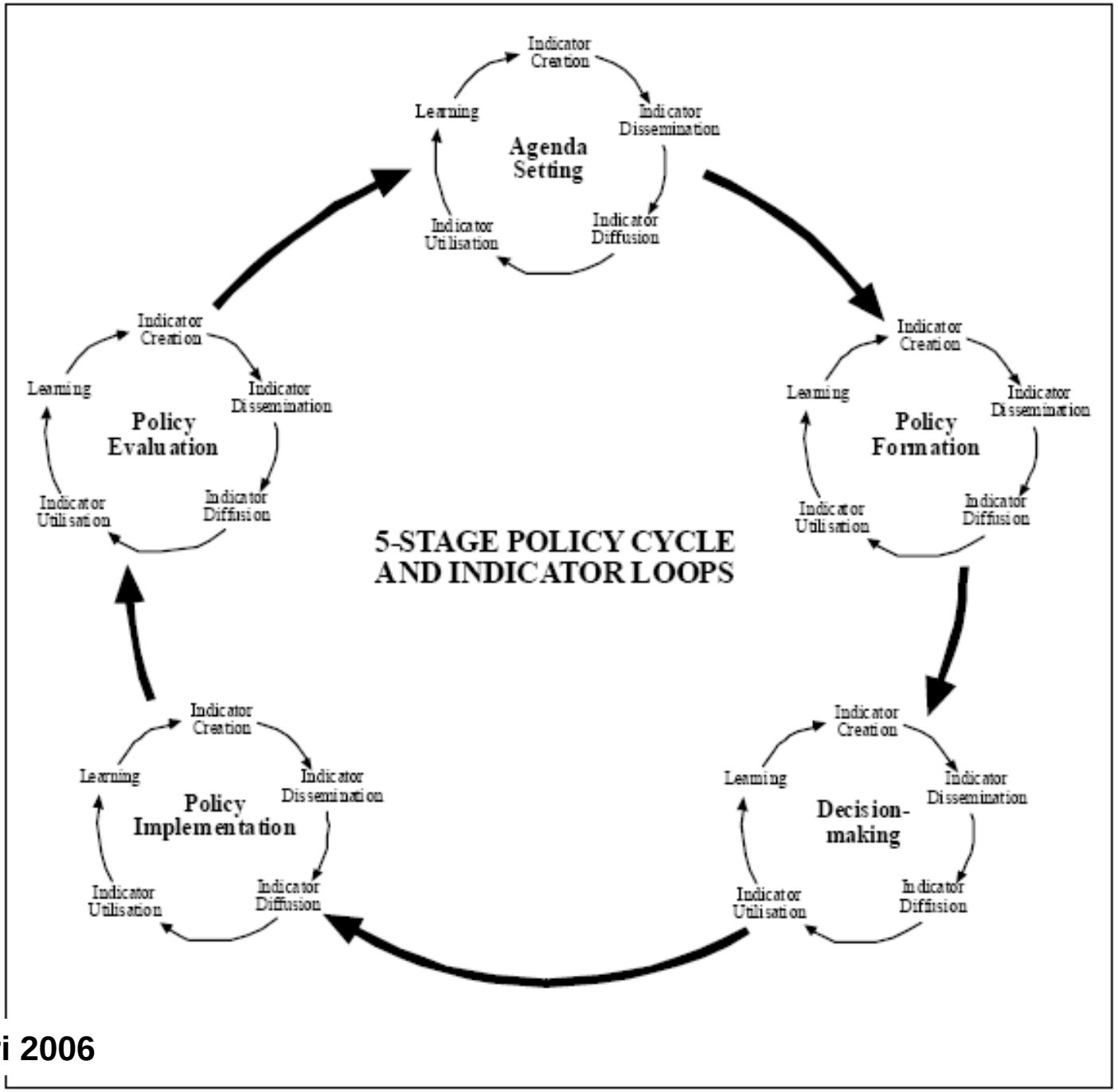
As work progresses:

- Continue to explore the border between ’universal’ and ’context sensitive’ elements in indicator development

This presentation:

- How does’policy context’ penetrate into environmental indicator development?
- Where and when could EST indicator definition benefit from considering which aspects of context?

# Role of context in definition and use of indicators in general


5-STAGE POLICY CYCLE
AND INDICATOR LOOPS
Agenda Setting
Policy Formation
Decision-making
Policy Implementation
Policy Evaluation
Indicator Creation
Indicator Dissemination
Indicator Diffusion
Indicator Utilisation
Learning

**Hezri 2006**

Science domain

Policy domain

- Borders between science and policy are blurred
- Not only 'knowledge transfer' but 'joint knowledge production
- Ecological indicators are '**boundary objects**', scientific objects which both inhabit several intersecting social worlds and satisfy the informational requirements of each of them

| **Problem type** | **Well structured** | **Unstructured** | **Badly structured** | **Moderately structured** |
|---|---|---|---|---|
| Policy process | Rule | Learning | Compromise | Negotiation |
| Role of scientist | Problem solver | Problem signaling | Accommodation | Advocacy |
| Use of knowledge | Data | Ideas | Concepts | Arguments |

**Turnhout et al 2003**

Decision making context:

- Internal decision-making context:
  - purpose/objectives
  - role of participants
  - process employed to arrive at a decision
- External decision-making context
  - Resource constraints
  - Political interest, etc
- Experts are strongly influenced by contextual factors when they identify, interpret and use evidence (health policy recommendations)


Dobrow et al 2004

# Role of context in definition and use of indicators in transport

# Transport evaluation methods as context

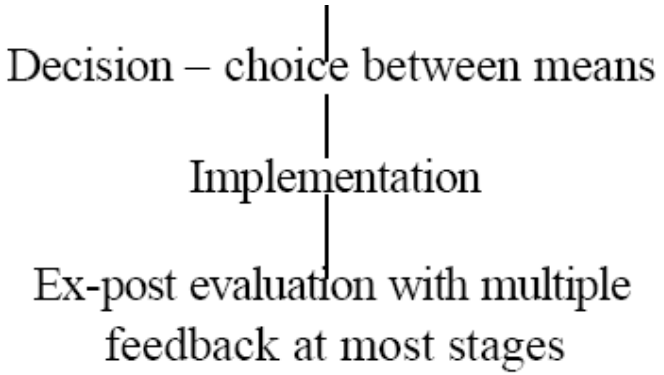
| Methods for data collection | Methods for data analysis | Formal assessment techniques / aggregation |
|---|---|---|
| • Surveys<br>• Use of secondary data<br>• Existing information / databases<br>• Case studies<br>• Focus groups<br>• Natural observations<br>• - Expert opinions<br>• Programme documents<br>• Literature reviews<br><br>**Giorgi & Tandon 2002** | • Statistical analysis<br>• Models<br>➢ Input/ Output<br>➢ Micro-economic<br>➢ Macro-economic<br>➢ Statistical<br>• Non-statistical analysis<br>➢ Expert panels<br>➢ SWOT analysis<br>➢ Colour vote<br>➢ Benchmarking<br>➢ Logical framework<br>➢ Delphi survey<br>➢ Group interviews<br>➢ Meta-analysis | • Cost-benefit analysis<br>• Cost-effectiveness analysis<br>• Multi-criteria analysis<br>• Scenarios<br>• Impact assessment<br>• Policy analysis |

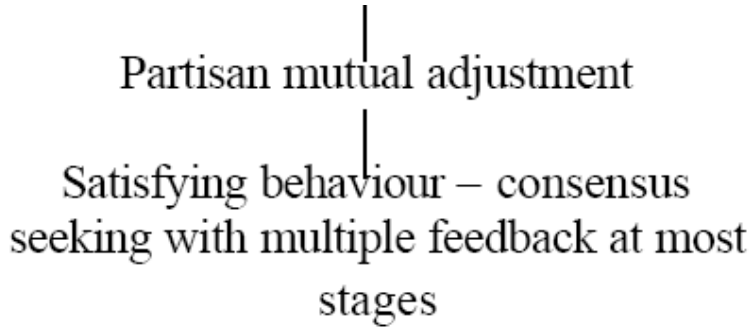
**BOX 1**
**The rational/analytical model (Simon)**

**BOX 2**
**The 'muddling through' model (Lindblom)**

Even in 'technical' modelling and forecasting context matters for, e.g :

- What to assume about induced traffic
- How large is the study area to be
- When can models be considered satisfactorily calibrated
- Assessment set within prior policy and administrative decision framework.




**Mackie & Nellthorp 2003**

# ’Paradigms’ (assessm. philos.) as context

- ‘Experimentalism’ (the rational model)
- ‘Neo-classical economics’ (consumer preferences)
- ‘Managerialism’ – (goals set by policy makers)
- ‘Public choice’ – Maximisation of self-interest for the decision makers (= political benefits)
- ‘Pragmatism’ – Enlightenment for decision makers and stakeholders
- ‘Interpretivism’ – Empowerment and education of all stakeholders; deliberative democracy as ideal
- ‘Realistic evaluation’; aiming to identify causal mechanisms that are active in the specific context

**Parsons 2004**

# Transport indicators – phases of application

| STAGE | Need for data (%) | Types of indicators and level of importance (5 = max) | | | |
|---|---|---|---|---|---|
| | | Context | Output | Intermediate outcome | Outcome |
| Problem identification | 100 | 3.9 | 3.0 | 2.7 | 3.4 |
| Target setting | 100 | 3.1 | 3.2 | 2.9 | 4.0 |
| Option generation | 94 | 2.9 | 4.0 | 3.4 | 3.2 |
| Model development | 100 | 2.7 | 3.6 | 4.3 | 3.3 |
| Appraisal (ex ante) | 94 | 2.5 | 3.6 | 3.8 | 3.5 |
| Implementation | 69 | 2.0 | 3.1 | 2.4 | 2.7 |
| Evaluation (ex post) | 81 | 2.2 | 4.0 | 3.6 | 4.3 |
| Monitoring | 88 | 2.5 | 3.3 | 4.3 | 4.5 |
| Benchmarking | 75 | 1.8 | 2.7 | 2.3 | 2.9 |
| Average | | 2.6 | 3.4 | 3.3 | 3.5 |

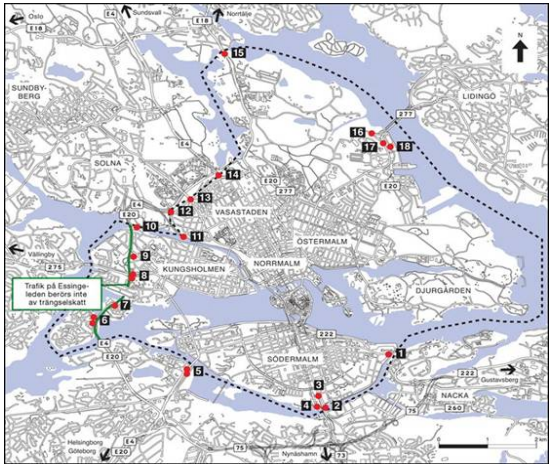
# Stockholm Concestion trial evaluation

Trial January- July 2006

Objectives:

- Reduce traffic volumes by 10-15% on the most congested roads
- Increase the average speed
- Reduce emissions of harmful pollutants and carbon dioxide
- Improve the urban environment as perceived by Stockholm residents

- Referendum sept 17, 2006
- Permanent program from august 2007



# Influence of indicators in Stockholm Congestion Charging trial

| | |
|---|---|
| Conceptua-lisation | Clearly defined measurement program for specified policy issues |
| Operatio-nalization | Intensive data collection before, during, after |
| Communi-cation | Almost instant reporting of key result indicators, extensive communication strategy, involvement of press, reference groups |
| Institutio-nalisation | Clear reponsibilities, relative independce of monitoring unit, requirement to use results for specified decision |

# Influence of TERM indicators on EU policy

| | |
|---|---|
| Conceptua-lisation | Clearly defined measurement program for specified iss olicy issues |
| Operatio-nalization | Intensiv delays and variation in defini of data |
| Communi-cation | Annual some attempts to activate d effort compared to scope |
| Institutio-nalisation | Indeper degree of policy adoption and linkage, no formal requirements to use the indicator report, no 'natural' policy venue |

# Role of context in definition and use of EST indicators

# EST in context….

- EST is a political concept, not exact:
- Defined by European union policy makers
- Sustainability comes in different varieties (weak, strong)
- System boundaries to be defined
- Transport is only partial contributor to environmental burdens

# Intended role of EST indicators is policy….

**TRB STI Subcommitee 2008:**

- Allowing communities to compare themselves with others,
- Analyzing trends,
- Evaluating policy with regard to sustainability goals

**Johnston 2008:**

- Sustainability assessment of modeled transportation and land use projects
- Sustainability assessment of policy packages

**Aparicio 2008:**

- Focus the attention of decision makers on the environmental performance of the sector
- Communicate to the public about key challenges and strategies
- Improve co-operation with regional and local governments

# COST 356 Indicator definition

- *An indicator is a variable, based on measurements, representing as accurately as possible and necessary a phenomenon of interest to human beings*

- *An environmental impact indicator is a variable based on measurements, representing an impact of human activity on the environment, as accurately as possible and necessary*

- *An indicator of environmentally sustainable transport is a variable, based on measurements, representing potential or actual impacts on the environment, or factors that may cause such impacts, due to transport systems, flows or policies, as accurately as possible and necessary*

# EST Indicators should answer…

a) *What is the transport contribution to each of the negative impacts on the environment? How can this contribution be measured or calculated?*

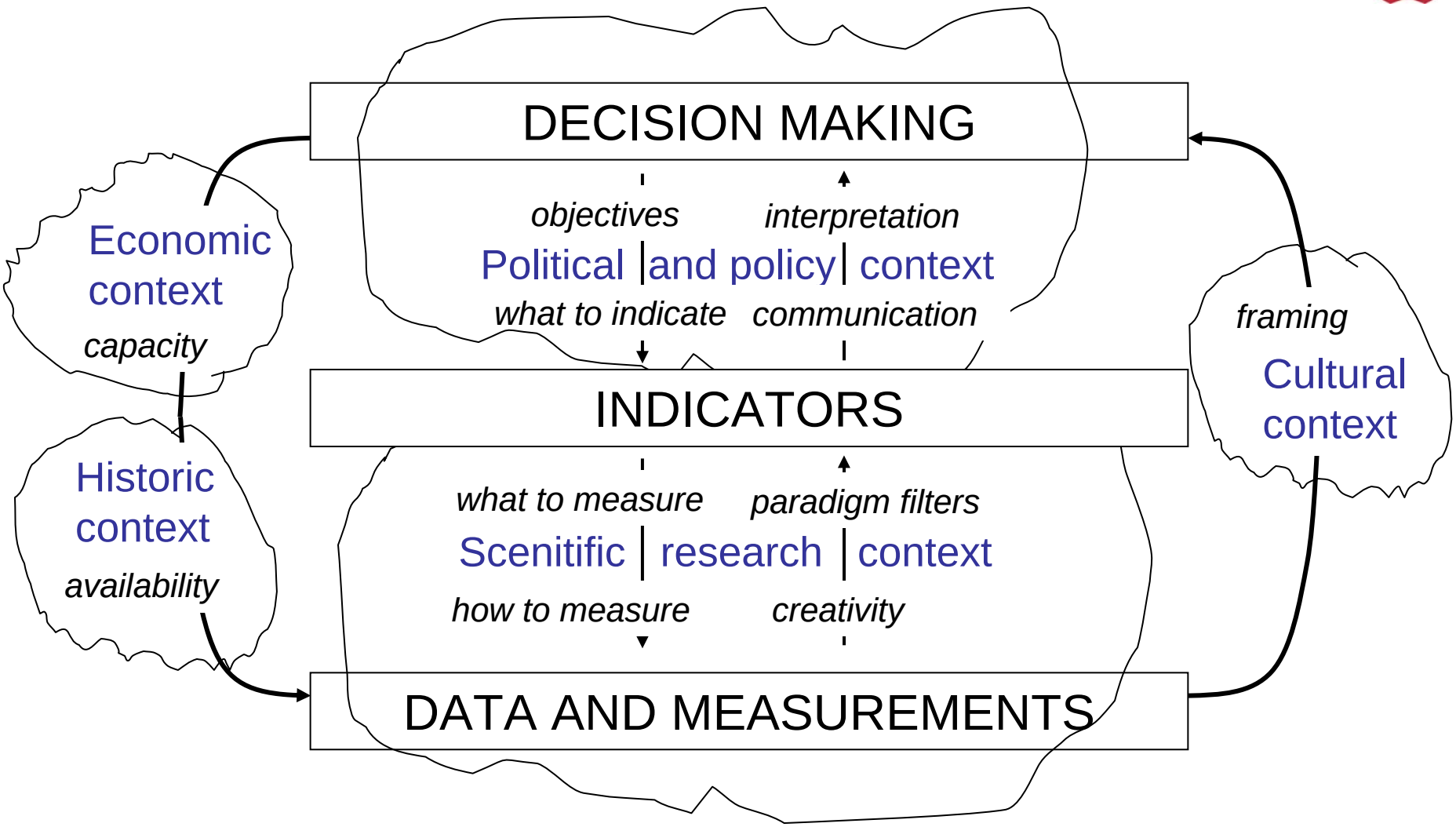
b) *What is the full or aggregate impact contribution of transport on the environment, how can the full impact be assessed (measured, calculated, synthesized)?*

c) *Are these contributions critical or not with regard to sustainability or other thresholds?*

d) *In what way can or will these contributions change as a consequence of transport projects or policy measures?*

# EST indicators and context

| | |
|---|---|
| *Transport contribution to each of the negative impact* | •Identification of impacts are sensitive to 'historical' context<br>•Transport system delimitations is sensitive to decision context |
| *Aggregate impact contribution of transport* | •Aggretation sensitive to 'paradigmatic' context in which aggregation takes place |
| *Are these contributions critical for sustainability?* | •Sustainability definition is sensitive to 'paradigmatic' context, both scientific and political |
| *In what way can these change as a consequence of transport projects or policies?* | •Transport measure assessment sensitive to policy level, phase, assessment paradigm, etc |


DECISION MAKING
objectives
interpretation
Political and policy context
what to indicate
communication
INDICATORS
what to measure
paradigm filters
Scenitific research context
how to measure
creativity
DATA AND MEASUREMENTS
Economic context
capacity
Historic context
availability
framing
Cultural context

# Summary / discussion

- A decision-making context is characterised by its complexity, comprising of many different dimensions, policy, historic, user, paradigmatic, internal, external…
- Context is likely to influence both definition, design and use of indicators
- All parts of EST measurement are context sensitive
- Contextual influence is not bad in itself:
- Can help to make indicators useful and applied
- Can help to reduce ”…too may answers to choose from”

- Option: allow case studies to provide explicitly considered contextual framing, as alternative/supplement to ’rigorous’ comprehensive scientific measurement approach

# References


Dobrow, Mark J.;Goel, Vivek; Lemieux-Charles, l; Black, L-A, 2006 The impact of context on evidence utilization: A framework for expert groups developing health policy recommendations Social Science & Medicine 63 (2006) 1811–1824

Giorgi, L.; Tandon A. 2002 Introduction: The theory and Practice of Evaluation. pp1-13 in: Giorgi, Liana and Pearman, Alan (editors). Project and Policy Evaluation in Transport. Aldershot: Ashgate

Girardin, P; Bockstaller, C.; van der Werf, H 1999. Indicators: Tools to Evaluate the Environmental Impacts of Farming Systems. Journal of Sustainable Agriculture: Volume: 13 Issue: 4, pp 5 – 21

Gudmundsson, H. (2003). The Policy Use of Environmental Indicators. Learning from Evaluation Research. The Journal of Transdisciplinary Environmental Studies Vol. 2, No. 2, 2003: 1-12

Hezri, A 2006. CONNECTING SUSTAINABILITY NDICATORS TO POLICY SYSTEMS. A thesis submitted for the degree of Doctor of Philosophy The Australian National University

Innes, Judith Elanor 1990. Knowledge and Public Policy. The search for meaningful indicators. Second expanded edition. Transaction publishers, New Brunswick

Mackie & Nellthorp 2003. TRANSPORT APPRAISAL IN A POLICY CONTEXT.

May, A. D; Grant-Muller, S; Marsden, G; Thanos, S. 2007. Improving the collection and moni-toring of urban travel data: An international review. TRB 2008 Annual Meeting CD-ROM

Parsons, Wayne 2004. Not just Steering but Weaving: Relevant knowledge and the craft of building policy capacity and coherence. Australian Journal of Public Administration 63 (1) pp 43-57 March 2004

Rice, J. C.; Rochet, M-J. 2005. A framework for selecting a suite of indicators for fisheries management. ICES Journal of Marine Science: Journal du Conseil 62(3) pp 516-527

Turnhout, E; Hisschemöller, M; Eijsackers, H. 2007. Ecological indicators: Between the two fires of science and policy Ecological Indicators 7 (2007) 215–228